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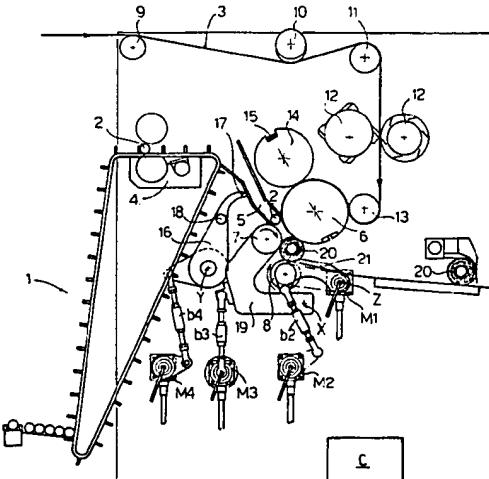
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⑯ Improvements to re-reeling machines for sheet material.

⑯ A re-reeling machine for sheet materials, particularly paper, comprising a series of rollers (9, 10, 11, 13) for feeding the sheet material (20) at constant speed in the space between a group of three rollers (6, 7, 8), into which tubular cores (2) are introduced, around which the sheet material is wound to form reels (20), and in which at least one of the three rollers (6, 7, 8) is foreseen mobile in order to allow the increase in the diameter of the reel during making up and its discharge, the improvements consisting in providing, in addition to the general motorization of the machine which sets in motion the two winding rollers (6, 7), separate motorizations (M1-M4), respectively for setting in rotation the third roller (8), for moving such roller, to vary the centre distance between the rollers (6, 7), and for operating means (16) suitable for introducing the cores (2) into the space between the rollers, all the various motorizations being interlocked with a control unit (C).



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The present invention relates to improvements to re-reeling machines for sheet materials, especially paper.

As is already known, in order to eliminate faults or imperfections in making up reels of sheet material, for example paper, it is usual for the reeling operation to be repeated on machines analogous to the reeling machines, but usually smaller, called re-reeling machines.

The improvements according to the invention, although referring to re-reeling machines in particular, can be applied equally well to reeling machines in general, and at any rate to machines for the production of rolls of sheet material.

In this type of machine, the reel is wound around a tubular core, which is made to rotate freely, that is without support chucks, between a group of three rollers, whose speed can be maintained substantially constant or be suitably varied during a winding cycle.

The group of three motorized rollers forms a seating or cradle of variable dimensions, in such a way that the three rollers are always in contact with the reel being made up, as the latter gradually increases in diameter. Therefore, at least one of the three rollers is mobile in order to allow the diameter of the reel to increase and the reel to be discharged at the end of winding. This is carried out by means of a leverage operated by a cam, which carries out complete rotation for each roll which is wound, and whose profile determines the diameter of the roll.

In the known reeling machines one sole motorization is foreseen, which controls, by means of suitable transmissions, all the machine members, amongst which the three winding rollers in particular, the cam which determines the diameter of the reel to be made up, and the means for introducing the core between the rollers and so on.

This kind of solution involves various drawbacks, the most important of which is certainly the complete lack of flexibility of the machine. In fact, for example, every time production has to be changed, even when only a slight variation is made to the dimensions of the reel, it is necessary to replace the cam with another one which has a suitable profile, and thence subsequently correct all the machine. This involves the machine being at a standstill for a long time (about four of five hours), which causes considerable economic losses (5 - 6 tons of product).

Furthermore, since the various adjustments are simply mechanical, during winding the material may be subjected to pressure shocks, which have a negative effect on the quality of the final product.

The aim of the invention is to eliminate the above-mentioned drawbacks by providing an extremely flexible reeling machine in which dead time

while adapting the machine for new production is reduced to a minimum, and which allows a high degree of uniformity to be achieved in the winding of the product.

5 This aim has been achieved, according to the invention, by the provision of separate motorizations for the fundamental elements of the machine. In particular, two of the three winding rollers are operated by the general motorization of the machine, while a separate motorization is foreseen for the third roller, which is in particular the mobile one, another motorization to determine the movement of such mobile roller, a motorization for the means for inserting the cores between the winding rollers, and a further motorization for moving one of the winding rollers in order to allow the core to be inserted.

Conveniently, the various motorizations are realized by means of brushless motors on which 20 encoders are mounted for controlling the position, whose phase is adjusted with reference to a reference or machine encoder, mounted onto one of the winding rollers, which takes its motion from the general motorization of the reeling machine.

25 The various motorizations are interlocked with a control unit which automatically gears the working of the machine to the type of reel to be made up, based on the starting data inserted, such as the diameter of the core, the final diameter of the reel and the number of metres of sheet material to be wound.

30 Further characteristics of the invention will be understood more clearly from the detailed description which follows, which refers to one of its purely exemplary, and therefore non-restrictive, embodiments illustrated in the appended drawing, consisting of only one figure, which shows a schematic view of a part of a re-reeling machine.

35 With reference to such figure, a re-reeling machine which may be considered substantially known in itself, comprises a feeding device 1, suitable for conveying the cores 2 onto which the sheet material 3, particularly paper, must be wound, towards a glueing machine 4, which applies a layer of adhesive to the cores, which then 40 advance towards a conveyor 5, by which the cores reach a winding unit, consisting of three motorized rollers 6, 7, 8. The paper follows the course shown in the figure, passing across a series of transmission rollers 9, 10, 11, a pair of perforating rollers 12, a counter roller 13, and then is partially wound onto the winding roller 6, against which a roller 14 acts having a retractable cutting blade 15. The cores 2 are introduced into the space between the 45 two winding rollers 6, 7 by means of a series of arms 16, provided with end pins 17, said arms having their fulcrum around one and the same axis y, perpendicular to the plane of the drawing, and

being connected to each other by a stiffening rod 18. The winding roller 7 is mounted onto an arm 19, with its fulcrum on an axis x, which is also perpendicular to the plane of the drawing, so as to be able to increase the centre distance between the rollers 6 and 7 at the moment that a core 2 is introduced between the rollers. Finally, the third roller 8, or pressure roller, is a mobile roller, which moves to allow the diameter of the reel 20 being made up to increase and the reel to be discharged from the winding space. For this purpose the roller 8 is carried by an arm 21, with its fulcrum around an axis z perpendicular to the plane of the drawing.

Conveniently the three rollers 6, 7, 8 rotate at constant speed during the whole winding cycle of a reel 20, including the phases of introducing a core 2 and discharging a made up reel, and such speed is substantially the same for the three rollers, with the possible exception of that of the roller 7, which may rotate at a slightly lower speed, in the order of 5%, for example.

In accordance with the invention, the various machine members are interlocked with a control unit C, which automatically gears the working of the machine on the basis of the data which have been inserted, such as the diameter of the core 2, the final diameter of the reel 20 and the number of metres of paper to be wound.

Such a degree of flexibility of the machine is made possible by the different motorizations adopted.

In fact, as well as the general motorization of the machine (not shown), which also operates the winding rollers 6, 7, a motor M1 for setting the mobile roller 8 in rotation, a motor M2 for controlling the movements of the mobile roller 8, a motor M3 for the movement of the winding roller 7 and a motor M4 for operating the pin-holding arms 16 are provided.

In particular, the motors M2-M4 are conveniently mobile reciprocating motion motors, which operate the corresponding members by means of the respective rigid arms b2, b3, b4.

Encoders are mounted respectively onto the various motors for controlling the position, set in phase with a reference or machine encoder mounted on the winding roller 6 operated by the general motorization.

Depending on the product which is desired, the positions in which motors M2, M3, M4 must be during the production cycle are located automatically on the basis of the data inserted into the control unit C.

Claims

1. A re-reeling machine comprising a number of rollers (9, 10, 11, 13) suitable for feeding sheet

material (3) at a constant speed towards a group of three motorized rollers (6, 7, 8), determining a winding space into which the cores (2) are introduced in sequence, onto which the said sheet material (3) is wound, wherein at least one (8) of the said three rollers is mobile in order to allow the increase in the diameter of the reel (20) being made up and its discharge from the space between the rollers when winding has been completed, and comprising also means (16) for introducing the cores (2) into the space between the winding rollers (6, 7), characterized in that it foresees a motor (M1) for setting the said mobile roller (8) in rotation, separate from the motor with operates the other two rollers (6, 7), a motor (M2) for controlling the movements of the mobile roller (8), and a motor (M4) for operating the means (16) for introducing the cores (2).

2. A re-reeling machine according to claim 1, characterized in that the centre distance between the winding rollers (6, 7) is variable to facilitate the introduction of the cores (2), and that such variation is obtained by means of a separate motor (M3) which produces a small movement of one (7) of the two rollers (6, 7).

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3. A re-reeling machine according to claim 1 or 2, characterized in that the said motors (M2, M3, M4) are brushless motors.

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4. A re-reeling machine according to any one of the previous claims, characterized in that the said motors (M2, M3, M4) operate with reciprocating rotary motion and control the corresponding members by means of respective rigid arms (b2, b3, b4).

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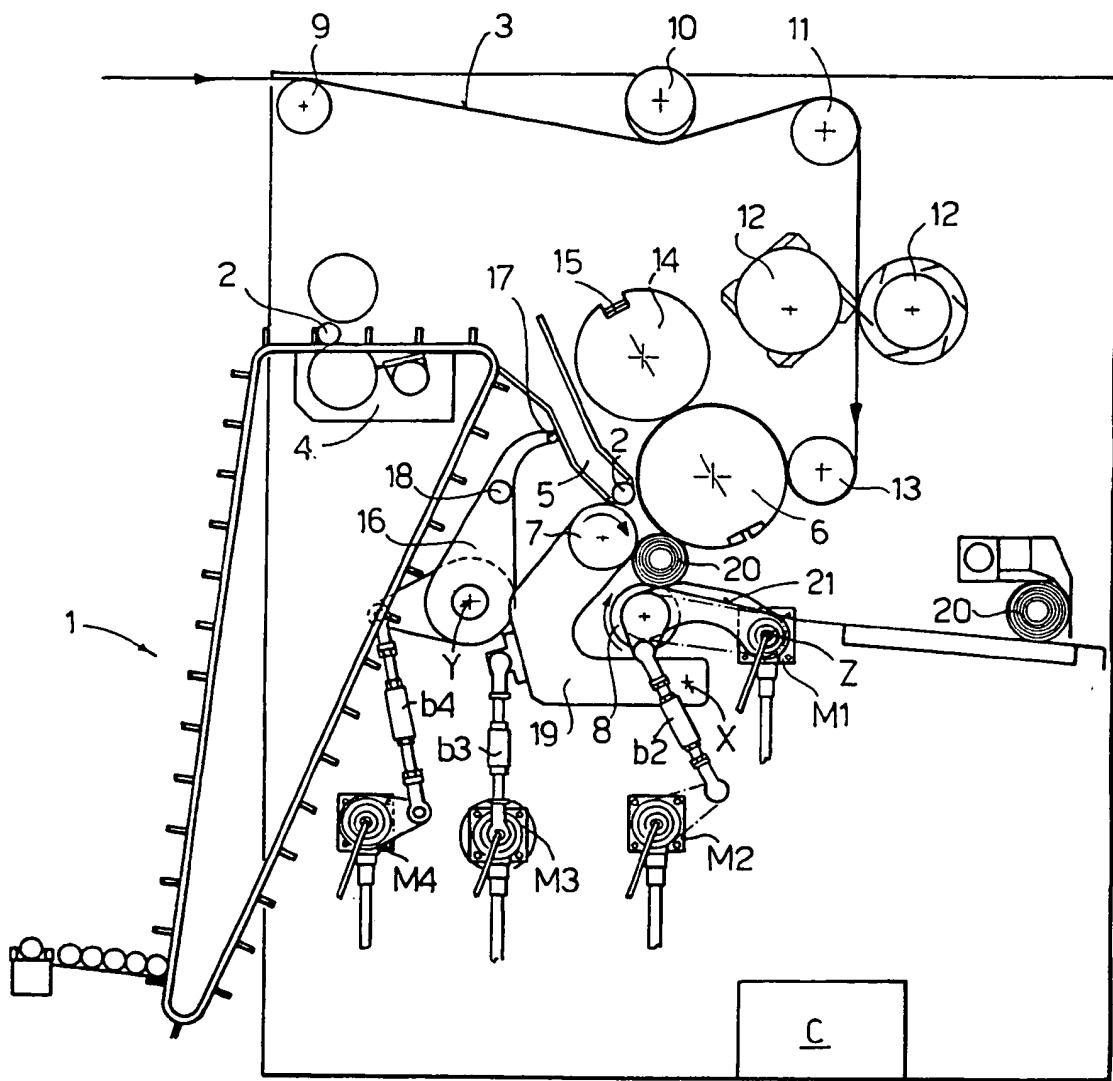
5. A re-reeling machine according to any one of the previous claims, characterized in that the said motors (M2, M3, M4) are provided with encoders for controlling the position, set in phase with a reference encoder mounted on the winding roller 6.

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6. A re-reeling machine according to any one of the previous claims, characterized in that the said motors (M1-M4), as well as the general motorization of the machine, are interlocked with a control unit (C) which adjusts the machine automatically, and particularly the zero position of the motors (M2, M3, M4), on the basis of the data inserted in the unit, such as, for example, the diameter of the cores (2), the final diameter of the reel (20) and the metres of sheet material to be wound onto each core (2).

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EUROPEAN SEARCH REPORT

Application Number

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DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
Y	EP-A-0 331 378 (PAPER CONVERTING MACHINE CO) * column 1, line 47 - column 5, line 57; figures *	1,2	B65H18/20
A	---	6	
Y	US-A-3 009 666 (H. W. MOSER) * the whole document *	1,2	
A	---	6	
A	EP-A-0 402 325 (PERINI NAVI S.P.A.) * column 2, line 39 - column 4, line 49; figures 1-3 *	1,2	
A	US-A-4 783 015 (A. SHIMIZU) * column 4, line 33 - line 37 * * column 6, line 28 - column 10, line 13; figures *	1-4	
A	EP-A-0 199 285 (PAPER CONVERTING MACHINE CO) * column 2, line 51 - column 3, line 47 * * column 8, line 6 - column 14, line 5 * * column 19, line 14 - line 22; figures 1-3, 11, 18 *	1,2	TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A	US-A-3 858 820 (J. W. CROUSE) * the whole document *	6	B65H

The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
THE HAGUE	23 MARCH 1992	DELZOR F.	
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application I : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

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